ON THE

ALKALINE EMANATIONS

FROM

SEWERS AND CESSPOOLS.

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It seems that, of all atmospheric impurities, the emanations from decomposing excreta are most prejudicial to public health. The recondite chemical nature of these emanations is quite unknown. Hydro-sulphuric acid and sulphide of ammonium certainly exist, though I believe to a less extent than usually supposed, for I have not unfrequently met with specimens of sewer water which produced no sensible discoloration of lead paper. Moreover, if these sulphur compounds existed in much larger amount, we know that their toxic powers are incapable of effecting the morbid results observed.

At the suggestion of Mr. Simon, I have made a few preliminary experiments on the nature of sewer and cesspool exhalations.

The liquid contents of a cesspool, situated in Cross Street, Stockwell, were first examined. The construction of this cesspool is peculiar. It had been originally a shallow well, but latterly has served as a more perfect diverticulum for the excreta of the neighbourhood, by means of drain-pipes communicating with the surrounding houses. After subsidence, a portion of the tolerably clear liquid was evaporated to

dryness. An imperial gallon contained 95·36 grains of solid matter, including 26·28 grains of fixed organic matter. By gently warming another portion of the liquid, there was evolved a considerable amount of permanent gas, consisting principally of carbonic acid; but a little common air and a trace of hydro-sulphuric acid were also present. Half a gallon of the liquid was distilled until the distillate had no longer an alkaline reaction. It had a peculiar fetid ammoniacal smell. After saturation with hydrochloric acid, it was evaporated to dryness. The residue was dissolved in water, filtered, and precipitated with bichloride of platinum in the usual manner. The platinum salt weighed 58·80 grains, which, supposing it to be the ordinary platino-chloride of ammonium, would correspond to 8·95 grains of ammonia per gallon. The precipitate was then dissolved in water, and crystallized. The crystals were large and well defined. They occurred as flattened orange-coloured tablets, apparently modified octohedra, but certainly different from the ordinary crystals of platino-chloride of ammonium. A combustion of these crystals was made with chromate of lead. To the combustion tube was attached a U tube containing baryta water, so as to afford visible evidence of the presence of carbonic acid should any be produced. In the course of a few minutes, the baryta water became quite opaque, and so large was the amount of carbonic acid liberated, that the deposit of carbonate of baryta disappeared, owing to its conversion into bicarbonate. The further addition of baryta water reproduced the precipitate, which effervesced readily on the addition of hydrochloric acid. Thus it was rendered evident that the alkaline vapour from the cesspool was not simply ammoniacal, but carbo-ammoniacal.

Similar experiments were made with some liquid obtained from a sewer in Griffin Street, York Road, Lambeth. An imperial gallon of the liquid yielded 131·12 grains of solid matter, including 48·96 grains of fixed organic matter. Half a gallon was submitted to distillation. The first portions of the distillate were extremely pungent, and the alkaline reaction continued until nearly all the liquid had passed over. The smell of the distillate corresponded exactly with that of the other specimen. After saturation with hydrochloric acid, and evaporation to dryness, the alkali was precipitated with

bichloride of platinum. The platinum salt weighed 187·38 grains, which, supposing it to be the ordinary ammonio-chloride, would be equivalent to 28·56 grains of ammonia per gallon. The precipitate was dissolved in water and crystallized. The crystals were large, well defined, and altogether undistinguishable in their appearance from those previously obtained. A combustion of the crystals with chromate of lead was attempted, with the object of ascertaining the per centage of carbon; but, despite the introduction of a large quantity of copper turnings into the combustion tube, nitrous vapours made their appearance, so that the estimation was prevented. The chloride of calcium tube and the potash bulbs were then removed, and a U tube, containing baryta water, substituted. An abundant precipitate of carbonate of baryta took place.

A portion of the crystallized platium salt was next incinerated. It gave 41·30 per cent. of platium.

The Platino-chloride of Ammonia yields . .	44 36	Per cent. of Platinum.
„ „ Methylamine „ . .	41·64	
„ „ Ethylamine „ . .	39·40	

Thus it appears probable that the crude volatile alkali of sewers contains a slightly larger amount of carbon than does methylamine, and a considerably less amount than does ethylamine. A second crop of crystals, obtained from the mother liquor of the preceding, gave 41·96 per cent. of platinum, and consequently contained a rather smaller proportion of carbon than did the original deposit.

It would be premature at present to hazard an opinion concerning the nature of the alkali. Despite the per centage analogy of composition, the crystals of the platinum salt obtained are unlike those of the platinum salt of methylamine. They bear a greater resemblance to those of the ethylamine platinic compound; and of course a mixture of about equal quantities of ammonia and ethylamine would correspond to the same per centage of platinum as methylamine. Should the alkali prove to be ethylamine, the subject would have a popular interest as suggesting the possibility of producing alcohol from sewer water. I am now distilling several gallons of

sewer water, and hope to obtain a sufficient quantity of the crude alkali to enable me to isolate and identify its carboniferous constituent. There is at present no evidence to show that this alkali is, or is not, the toxic ingredient of sewer exhalations.